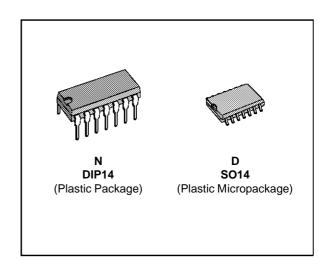


TS27L4C,I,M

VERY LOW POWER QUAD CMOS OPERATIONAL AMPLIFIERS

- EXCELLENT PHASE MARGIN ON CAPACITIVE LOADS
- SYMETRICAL OUTPUT CURRENTS
- LOW OUTPUT DYNAMIC IMPEDANCE
- THE TRANSFER FUNCTION IS LINEAR
- PIN TO PIN COMPATIBLE WITH STANDARD QUAD OP-AMPs (TL084 -LM324)
- STABLE AND LOW OFFSET VOLTAGE
- THREE INPUT OFFSET VOLTAGE SELECTIONS



ORDER CODES

Part Number	Temperature	Paci	Package		
I alt Number	Range	N D			
TS27L4C/AC/BC	0°C, +70°C	•	•		
TS27L4I/AI/BI	-40°C, +125°C	•	•		
TS27L4M/AM/BM	-55°C, +125°C	•	•		
Example: TS27L4/	ACN	•	•		

DESCRIPTION

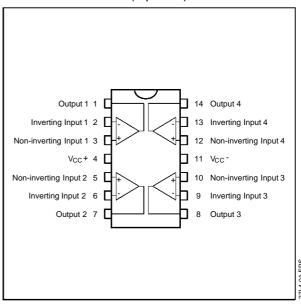
The TS274 series are low cost, low power quad operational amplifiers designed to operate with single or dual supplies. These operational amplifiers use the SGS-THOMSON silicon gate LIN MOS process giving them an excellent consumption-speed ratio. These series are ideally suited for low consumption applications.

Three power consumptions are available allowing to have always the best consumption-speed ratio:

• I_{CC} = 10 μ A/amp. : TS27L4 (very low power) • I_{CC} = 150 μ A/amp. : TS27M4 (low power) • I_{CC} = 1mA/amp. : TS274 (high speed)

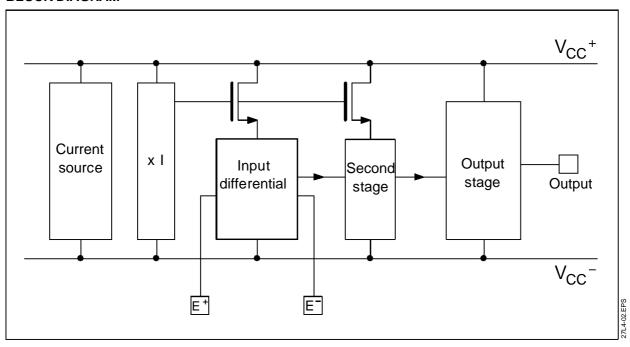
These CMOS amplifiers offer very high input impedance and extremely low input currents. The major advantage versus JFET devices is the very low input currents drift with temperature (see figure 2).

PIN CONNECTIONS (top view)



October 1995 1/8

BLOCK DIAGRAM



MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC} ⁺	Supply Voltage - (note 1)	18	V
V_{id}	Differential Input Voltage - (note 2)	±18	V
Vi	Input Voltage - (note 3)	-0.3 to 18	V
Io	Output Current for V _{CC} ⁺ ≥ 15V	±30	mA
I _{in}	Input Current	±5	mA
T _{oper}	Operating Free-Air Temperature Range TS27L4C/AC TS27L4I/AI/I TS27L4M/AI	-40 to +125	°C
T _{stg}	Storage Temperature Range	-65 to +150	°C

Notes: 1. All voltage values, except differential voltage, are with respect to network ground terminal.

2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.

3. The magnitude of the input and the output voltages must never exceed the magnitude of the positive supply voltage.

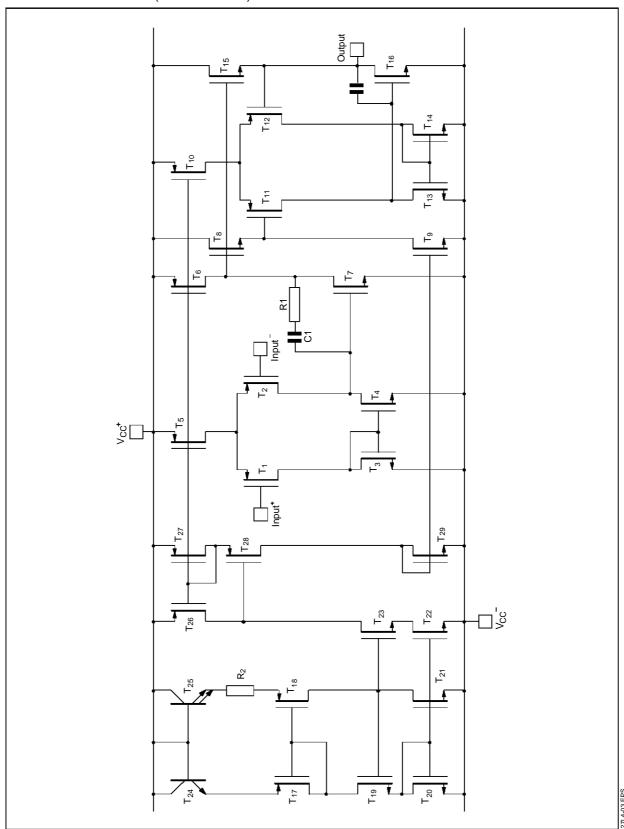
OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V _{CC} ⁺	Supply Voltage	3 * to 16	V
V _{icm}	Common Mode Input Voltage Range	0 to V _{CC} ⁺ - 1.5	V

* Selected devices only.



SCHEMATIC DIAGRAM (for 1/4 TS27L4)



ELECTRICAL CHARACTERISTICS

 V_{CC}^+ = +10V, V_{CC}^- = 0V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter		TS27L4C/AC/BC			TS27L4I/AI/BI TS27L4M/AM/BM		
-		Min.	Тур.	Max.	Min.	Тур.	Max.	
Vio	$\label{eq:local_problem} \begin{split} & \text{Input Offset Voltage} \\ & V_O = 1.4V, V_{ic} = 0V & \text{TS27L4C/I/M} \\ & \text{TS27L4AC/AI/AM} \\ & \text{TS27L4BC/BI/BM} \\ & \text{T}_{min.} \leq T_{amb} \leq T_{max.} & \text{TS27L4C/I/M} \\ & \text{TS27L4AC/AI/AM} \\ & \text{TS27L4BC/BI/BM} \end{split}$		1.1 0.9 0.25	10 5 2 12 6.5 3		1.1 0.9 0.25	10 5 2 12 6.5 3.5	mV
DV_io	Input Offset Voltage Drift		0.7			0.7		μV/°C
l _{io}	$ \begin{array}{l} \text{Input Offset Current - (note 1)} \\ V_{ic} = 5V, \ V_o = 5V \\ T_{min.} \leq T_{amb} \leq T_{max.} \end{array} $		1	100		1	200	pA
l _{ib}	Input Bias Current - (note 1) $ V_{ic} = 5V, \ V_o = 5V \\ T_{min.} \le T_{amb} \le T_{max.} $		1	150		1	300	pA
V _{OH}	$ \begin{array}{l} \mbox{High Level Output Voltage} \\ \mbox{$V_{id} = 100mV, R_L = 1M\Omega$} \\ \mbox{$T_{min.} \le T_{amb} \le T_{max.}$} \end{array} $	8.8 8.7	9		8.8 8.6	9		V
V _{OL}	Low Level Output Voltage V _{id} = -100mV			50			50	mV
A_{vd}	$ \begin{array}{l} \text{Large Signal Voltage Gain} \\ V_{o} = 1 \text{V to 6V}, R_{L} = 1 \text{M}\Omega, V_{ic} = 5 \text{V} \\ T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}} \end{array} $	60 45	100		60 40	100		V/mV
GBP	Gain Bandwidth Product $ \begin{array}{l} A_V = 40 dB, R_L = 1 M\Omega, C_L = 100 pF \\ f_{in} = 10 kHz \end{array} $		0.1			0.1		MHz
CMR	Common Mode Rejection Ratio V _o = 1.4V, V _{ic} = 1V to 7.4V	65	80		65	80		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^{\dagger} = 5V$ to $10V$, $V_0 = 1.4V$	60	80		60	80		dB
Icc	Supply Current (per amplifier) $ A_V = 1, \text{ no load, } V_0 = 5V $ $ T_{min.} \le T_{amb} \le T_{max.} $		10	15 17		10	15 18	μА
lo	Output Short Circuit Current $V_{id} = 100mV$, $V_0 = 0V$		60			60		mA
I _{sink}	Output Sink Current $V_{id} = -100 \text{mV}, V_0 = V_{CC}$		45			45		mA
SR	Slew-Rate at Unity Gain $R_L = 1M\Omega$, $C_L = 100pF$, $V_i = 3$ to 7V		0.04			0.04		V/μs
Øm	Phase Margin at Unity Gain $A_V = 40dB$, $R_L = 1M\Omega$, $C_L = 100pF$		45			45		Degrees
Kov	Overshoot Factor		30			30		%
en	Equivalent Input Noise Voltage $f = 1kHz$, $R_S = 100\Omega$		68			68		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$ dB
V _{O1} /V _{O2}	Channel Separation		120			120		dB

Note: 1. Maximum values including unavoidable inaccuracies of the industrial test.

27L4-05.EPS

27L4-07.EPS

TYPICAL CHARACTERISTICS

Figure 1: Supply Current (each amplifier) versus Supply Voltage

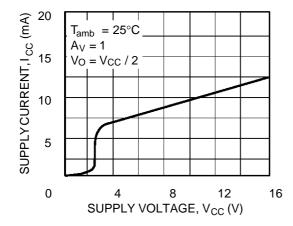


Figure 3a: High Level Output Voltage versus High Level Output Current

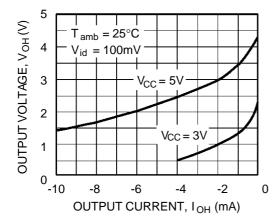


Figure 4a: Low Level Output Voltage versus Low Level Output Current

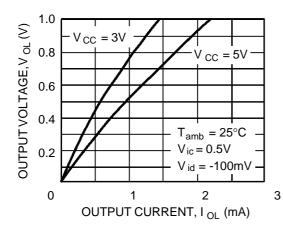


Figure 2: Input Bias Current versus Free Air Temperature

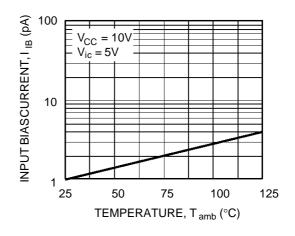


Figure 3b: IHigh Level Output Voltage versus High Level Output Current

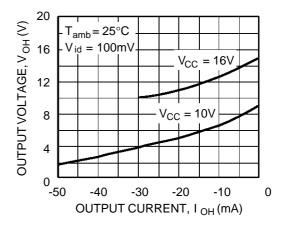
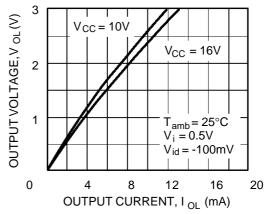


Figure 4b: Low Level Output Voltage versus Low Level Output Current



27L4-08.EPS

27L4-04.EPS

27L4-06.EPS

TYPICAL CHARACTERISTICS (continued)

Figure 5 : Open Loop Frequency Response and Phase Shift

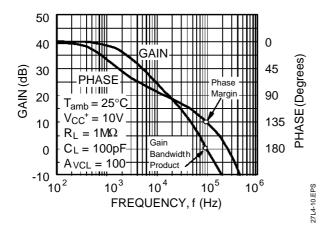


Figure 7: Phase Margin versus Supply Voltage

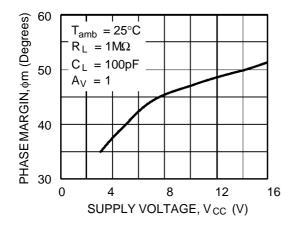


Figure 9: Slew Rates versus Supply Voltage

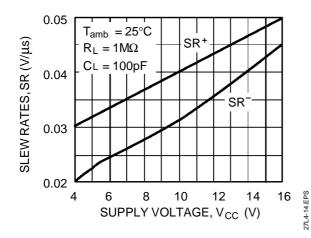


Figure 6 : Gain Baindwidth Product versus Supply Voltage

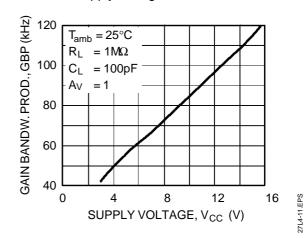


Figure 8: Phase Margin versus Capacitive Load

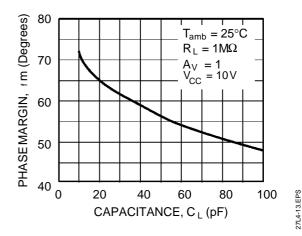
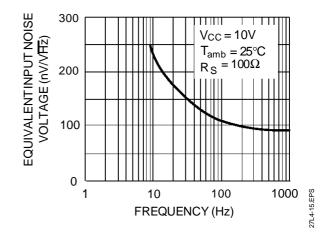


Figure 10: Input Voltage Noise versus Frequency

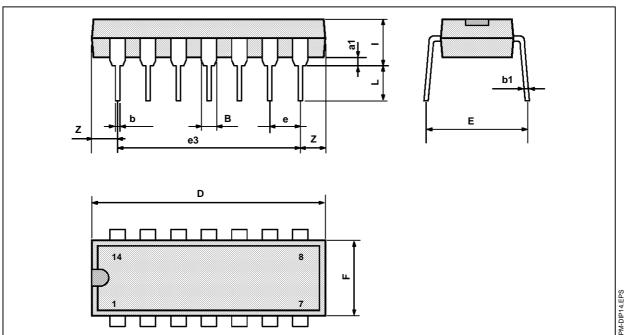


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27L4-12.EPS

PACKAGE MECHANICAL DATA

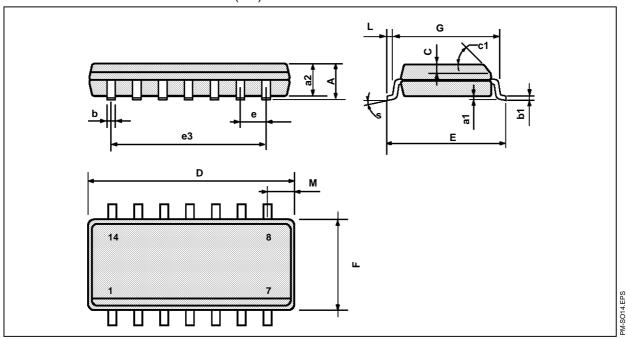
14 PINS - PLASTIC DIP



Dimensions	Millimeters		Inches			
Dilliensions	Min.	Тур.	Max.	Min.	Тур.	Max.
a1	0.51			0.020		
В	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
е		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

PACKAGE MECHANICAL DATA

14 PINS - PLASTIC MICROPACKAGE (SO)



Dimensions		Millimeters			Inches	
Difficusions	Min.	Тур.	Max.	Min.	Тур.	Max.
А			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
С		0.5			0.020	
c1			45°	(typ.)		
D	8.55		8.75	0.336		0.334
E	5.8		6.2	0.228		0.244
е		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.020		0.050
М			0.68			0.027
S	8° (max.)					

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